UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/929,789	08/14/2001	Michael A. Tischler	2771-161-CON	1145

25559 7590 09/23/2004

ATMI, INC.
7 COMMERCE DRIVE
DANBURY, CT 06810

EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/929,789	TISCHLER ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *39-76* is/are pending in the application.

4a) Of the above claim(s) *39-60,62,68,69 and 72-76* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *61, 63-67, 70 and 71* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. This application contains claims 39-60, 62, 68, 69 and 72-76 drawn to an invention nonelected with traverse in the paper filed on 12/15/2003. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 61, 63-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akasaki et al (US 4,855,249) in view of Gmitter et al (US 4,883,561) or in view of Bozler et al (US 4,837,182).

Akasaki et al discloses a method of growing a single crystalline, hetero-epitaxial $Al_xGa_{1-x}N$ film on a sapphire substrate (Abstract). Akasaki et al also discloses forming GaN and using an AlN buffer layer (claim 1 and col 4, ln 40-55).

Akasaki et al does not teach removing the heterogeneous substrate to yield a single crystal substrate.

In a method of removing a substrate, note entire reference, Gmitter et al teaches removing an epitaxial layer from a single crystal substrate by providing a thin release layer between the film and the single crystal substrate and selectively etching the release layer (Abstract and claims 1-2). Gmitter et al also teaches the epitaxial growth of GaAs on sapphire and other III-V compounds should be useable with invention (col 10, ln 15-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Akasaki et al method of depositing a GaN, III-V semiconductor, on a sapphire substrate with Gmitter et al method of removing a III-V semiconductor from a sapphire substrate so that the substrate can be reused (col 1, ln 5-25), thereby reducing costs.

In a method of removing a substrate, note entire reference, Bozler et al teaches forming a mask on a substrate to expose single crystal areas, depositing a crystallizable material over the substrate and mask and separating the crystalline material from the substrate and optionally reusing the substrate (claims 1-2). Bozler et al also teaches the crystallizable material can be preferentially etched, melted, sublimed, cleaved or otherwise removed to separate the sheet of

crystalline material from the substrate (col 6, ln 50-65). Bozler et al also teaches GaAs is a suitable substrate and a carbonized photoresist mask **12** (col 7, ln 5-55). Bozler et al also teaches gallium arsenide, silicon, and other semiconductors or their associated alloys can be employed in the fabrication of sheets of crystalline materials (col 26, ln 25-55). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Akasaki et al method of depositing a GaN, a semiconductor, on a substrate with Akasaki et al's method of removing a semiconductor from a substrate so that the substrate can be reused, thereby reducing costs ('182 col 6, ln 65 to col 7, ln 5).

Referring to claims 64-67, the combination of Akasaki et al and Gmitter et al or the combination of Akasaki et al and Bozler et al teach an intermediate layer of a mask or an AlN buffer. The combination of Akasaki et al and Gmitter et al or the combination of Akasaki et al and Bozler et al is silent to the intermediate layer includes a template layer, a protective layer or an etch stop layer. However, these limitations are considered to be intended use limitations and a recitation of intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the claimed intended use, then it meets the claim. The mask and AlN layer taught would inherently be capable of performing the claimed intended use.

4. Claims 70-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akasaki et al (US 4,855,249) in view of Gmitter et al (US 4,883,561) or in view of Bozler et al (US 4,837,182) as applied to claims 61 and 63-67 above, and further in view of Manasevit (US 3,922,475).

The combination of Akasaki et al and Gmitter et al or the combination of Akasaki et al and Bozler et al teach all of the limitations of claim 70, as discussed previously, including a GaN on a sapphire substrate. The combination of Akasaki et al and Gmitter et al or the combination of Akasaki et al and Bozler et al does not teach a GaAs substrate.

In a method of producing nitride films, note entire reference, Manasevit teaches single crystal gallium nitride films can be grown on sapphire substrates or gallium arsenide substrates (col 1, ln 45-55). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Akasaki et al and Gmitter et al or the combination of Akasaki et al and Bozler et al by using a GaAs substrate, as taught by Manasevit, because substitution of known equivalent for the same purpose is held to be obvious (MPEP 2144.06).

Referring to claim 71, the combination of Akasaki et al, Manasevit and Gmitter et al or the combination of Akasaki et al, Manasevit and Bozler et al teach removing the substrate by preferentially etching. The combination of Akasaki et al, Manasevit and Gmitter et al or the combination of Akasaki et al, Manasevit and Bozler et al is silent to the temperature at which etching occurs. Temperature is well known in the art to be a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Akasaki et al, Manasevit and Gmitter et al or the combination of Akasaki et al, Manasevit and Bozler et al by optimizing the temperature by conducting routine experimentation of a result effective variable (MPEP 2144.05). Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235(CCPA 1955)).

Response to Arguments

5. Applicant's arguments filed 7/2/2004 and 5/28/2004 have been fully considered but they are not persuasive.

Applicants' argument that the methods disclosed by Gmitter and Bozler are only applicable to the specific substrate/film structure is fundamentally different from the substrate/film structure formed by the Akasaki process is noted but is not found persuasive. The instantly claimed independent claims 61 and 63 do not claim the method used to remove the substrate. The claims merely recite deposition on a substrate and removal of the substrate. Both Gmitter and Bozler teach the desirability of removing a substrate from an epitaxial film so the substrate can be reused ('561 col 1, ln 10-40 and '182 col 35-45). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Akasaki by removing the substrate, as taught by Bozler or Gmitter regardless of the method used to remove the substrate. Also, Gmitter is not limited to the film/substrate structure, as suggested by applicants. Gmitter clearly teaches other III-V compounds (GaN is a III-V compound) should be useable with the teachings of his invention (col 10, ln 40-45) and broadly teaches selectively etching to remove an epitaxial film from a substrate without requiring any specific materials (claims 1, 4, 5, 12 and 13); therefore there is a reasonable expectation of success.

Applicants' arguments against Bozler are noted but are not found persuasive. Applicants' allege that Bozler requires a growth mask and Akasaki does not contain any crystal growth masks that are removable. Bozler teaches sheets of crystalline material can be growth without the necessity of a growth mask by using strips of crystalline material (col 3, ln 15-30). Therefore,

Bozler does not require a growth mask. Bozler merely requires the use of strips of crystalline material on a substrate, forming a crystalline material on the strips and subsequently removing the crystalline material from the substrate. Patterning the AlN buffer layer of Akasaki into stripes would be an obvious modification to aid in the removal of the GaN layer. Bozler is not limited to any particular materials (col 3, ln 20-45) or even the use of a growth mask (col 3, ln 20-25), as suggested by applicant. Furthermore, removal of the substrate using other methods, such as cracking, sublimation, selective melting or other techniques (col 2, ln 10-15) would still be obvious to person of ordinary skill to remove the substrate without employing the invention taught by Bozler to remove the substrate from the structure taught by Akasaki.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Edmonds (US 3,806,777) teaches gallium nitride is a useful substrate for making light emitting PN junctions (col 3, ln 5-20).

Hasegawa et al (US 4,168,998) teaches removing wafers from a substrate by using a carbonaceous powder (Abstract).

JP 52-103399 teaches overgrowth of GaN on a silicone base (English Abstract).

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song

Examiner
Art Unit 1765

MJS

NADINE B. NORTON
SUPERVISORY PATENT EXAMINER